THE NEEDS OF DEAF STUDENTS IN ENVIRONMENTAL STUDIES

by

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PROBLEM STATEMENT

The original intent of this honors research project was to design a program of environmental interpretation for a class of hearing impaired students, utilizing techniques and activities which would sharpen the use of the other senses available to the hearing impaired. Through the course of obtaining information and understanding of the hearing impaired while volunteering at the Ohio School for the Deaf, it became apparent that further data would be needed to effectively design a program of environmental interpretation. Thus, the emphasis of this study was shifted from the actual design of a program to obtaining and analyzing information which might be used to effectively design a program of environmental interpretation for deaf students, through the use of a questionnaire. Because this honors research project was a study of deaf students in a school, the term Environmental Education might better be used than Interpretation. The study of what "Environmental" topics had been covered came from looking at what "Science" topics had been covered, and therefore, much of the information gained from the questionnaire is more generalized to science, rather than environmental studies.

The actual objective, then, was to determine what types of science topics are presently being taught in classes for the hearing impaired, what importance is placed on science through the amount of time spent per day, at what level science

topics need to be taught, what aspects of teaching science cause difficulties, what resource materials are available for use by the teachers, and what topics of science study are needed. Also to be determined was the degree of correlation between differing variables on the questionnaire. This information might then be utilized in developing activities in environmental study at the schools questioned, and perhaps as basic background for other schools.

LITERATURE REVIEW

A small amount of literature was found pertaining directly to the needs of hearing impaired students in environmental studies, yet a variety of literature on related topics provided some insight into the present understanding of this subject. As stated by Dr. Robert Roth,

> Specifically, environmental education is concerned with developing a citizenry that is:
> -knowledgeable about biophysical and socio-cultural environments of which man is a part;
> -aware of environmental problems and management alternatives that can be employed in solving these problems; and
> -motivated to act responsibly in developing diverse environments that are optimum for living a quality life.[1]

The hearing impaired are a part of this citizenry, yet many may miss the development of the above characteristics because of their unique situation. In the words of Helen Keller (London, 1933), "The problems of deafness are more complex, if not more important than those of blindness. Deafness is a much worse misfortune because of the loss of the most vital stimulus - the sound of the voice that brings language, sets thoughts astir, and helps us in the intellectual company of man."[2]

The degree of communication possible is often determined by the age of onset of deafness. If deafness occurs after the child has developed language, (postlingual), approximately at the age of four, the communication handicap will be less than if prelingual.

An assumption often made with present interpretive techniques (ex: signs, interpretive messages) is that the deaf person needs only to read the sign or message in order to understand all the information. Yet, most of the deaf person's knowledge is built on concrete ideas with very basic terminology. His understanding does not equip him to deal with abstractions, and his knowledge of terms is such that it is unlikely that he would be able to understand any of the interpretive signs.[3]

The hearing impaired need to begin learning terms and ideas basic to science at an early age, and to have environmental topics as a continuing portion of the curriculum. Two examples of myths about the capacity of the handicapped to perform in science and pertaining comments, as observed by Ben Thompson, may be helpful at this point:

Myth: Most handicapped students need to learn the basics; therefore, science is not important to them.

Comment: Science <u>is</u> a basic. You can only read, write, and cypher about your environment; science is the business of the human environment. Students learn to read and communicate better when they have had experiences with what they are to read and communicate. Handicapped students have usually been deprived of hands-on experiences. They really need science. Doing science in the upper grades requires development of reading and math skills for a purpose. Having to understand and follow directions and to correlate reality with what one reads about, becomes a powerful stimulant for effective communication. Research in science and reading supports the point that science learning enhances reading and other communication skills.

Myth: Handicapped students can't learn science. If they are slow learners, science is too hard. If they have a physical handicap, they lack an essential sense or skill.

> Comment: Handicapped students in grade school can enjoy success in science as nowhere else in the curriculum....When given chances to experiment and experience their environment handicaps often disappear.[4]

An encouraging example of the positive results of environmental education with a group of handicapped students is included in an article from the September, 1978 issue of the Environmental Education Report. The school discussed is, by the way, one of the schools included in the questionnaire sample for this study.

> The learning disabilities teachers of Mayfield Schools have found that the outdoor environment is a perfect stimulus to reward their students for meeting their behavioral or academic goals. Not only do the teachers find new ways to relate to their students as they participate in an outdoor experience, but they also discover many new facets about the students' gross motor skills, self-concept, and willingness to attempt new things.
>
> The learning diabilities outings utilize natural objects as apparatus to develop confidence and self-esteem as the students give moral and physical support to their classmates. Inclined logs, tree bridges, across ravines, swinging vines, and steep hills are all teaching aids for the program.[5]

METHODOLOGY

Information and data for this research project were obtained from a variety of sources: a review of literature, undertaking of a project with deaf students at Corkscrew Swamp Sanctuary, volunteering at the Ohio School for the Deaf, observing at Millridge and Hilltop schools, distributing a questionnaire and analyzing it by computer programs.

Corkscrew Swamp Sanctuary is an Audubon Wildlife Sanctuary near Naples, Florida. While completing an internship there, a program of field trips was set up for deaf students from Ft. Myers and other handicapped students from Naples. The purpose of this program was to, not only benefit the students with an enrichment of their environmental experience, but also to observe the reactions and capabilities of hearing impaired students in the out of doors. A slide program of Corkscrew Swamp was presented to three classes of hearing impaired students, with myself talking with a microphone in front of the students, and another assisting intern naturalist talking with the aid of an interpretor for the deaf. The three classes of hearing impaired students then visited Corkscrew Swamp Sanctuary on a field trip. The classes were split into two groups, myself leading a hike utilizing the interpretor, and the other naturalist utilizing a microphone. Observations of the amount of understanding of science ideas the students already had, the reactions to various natural objects, and the correlation between degree of deafness and

apparent understanding were made. (See Appendix A)

Additional observations were made while volunteering with Melissa Koenig, the teacher of the horticulture shop class at the Ohio School for the Deaf. Facilities consisted of a greenhouse and a wooded area through which a short trail runs. Each day the students visited the outdoor area, learning to care for it through the use of tools, and to understand more about the natural environment.

The classes for hearing impaired at the Millridge and Hilltop schools were both visited. Observations were made and an opportunity was given at Hilltop to sit down with the deaf students and talk about what experiences and understanding they have about the natural environment. (See Appendix B)

A questionnaire was drawn up, as well as an accompanying letter describing the intent of the questionnaire, and distributed to three schools in the Cleveland area. (See Appendix C) These schools were Millridge Elementary, Hilltop Elementary and Lakewood Schools. Each of these schools has classes for the hearing impaired, and some have hearing impaired students mainstreamed into some regular classrooms. Approximately twenty-five questionnaires were distributed to the teachers for the deaf and to the administrators in charge of the hearing impaired programs, with eighteen being returned. The questionnaires were systematized, according to the questions and varying answers, in order to record the data available. A computer analysis of the data was done, using the Statistical Package for the Social Sciences (SPSS)

program. This program was used to summarize data and to determine correlations between different variables on the questionnaire. The correlation, represented by the value "r" is the relationship between two variables. A high "r" value shows that the two variables are more closely related than would a low "r" value. The symbol "P" represents the probability of the results, the correlation number, being due to chance rather than expressing a true relationship. Therefore, the lower the"P"value, the closer the relationship between variables.

RESULTS

The SPSS computer program was used to analyze the results of the eighteen returned questionnaires. Summaries of the responses included determining the absolute frequency, number of times out of eighteen a response was given, relative frequency, the percentage of the whole of that response given, adjusted frequency, the percentage of the whole not including missing answers, and cumulative frequency. Also of interest in a few variables is the mean and standard deviation. Correlations were done for a number of the variables, the most important of which will be commented on.

Table 1 summarizes the number and percentage of questionnaires which came from each of the three schools: Lakewood, Millridge, or Hilltop. The grades included in each of the schools is shown by an "X" placed in the grade category if included in that school and the number of questionnaires received from that grade category in parentheses.

TABLE 1: School Code

computer code	category	#	%	grade categories nursery	primary	intermed.	Jr.High	Sr.High
1	Lakewood	11	61.1	X (1)	X (1)	X (2)	X (4)	X (3)
2	Millridge	3	16.7		X (2)	X (1)		
3	Hilltop	4	22.2		X (1)	X (2)		X (1)

Table 2 summarizes the number and percentage of questionnaires which were received from each actual grade level, whereas Table 3 compares actual grade level with grade level the curriculum is planned for. Part A of Table 3 summarizes

the number and percentage of teachers which plan their science curriculum for the varying grade levels, nursery, primary, and intermediate. Part B lays out the answers that each questionnaire gave comparing actual grade level to planned grade level. Part C summarizes the results of Part B by showing how many of those teaching each actual grade level aim their curriculum at another grade level. For instance, of the five teachers who have students in the intermediate grade level, one plans the curriculum at a nursery level and four plan the curriculum at a primary level. It is interesting to note that, though actual grade levels through high school were taught, none of the curriculum was planned above the intermediate level.

TABLE 2: School Code and Grade

computer code	category	age of category	#	%
1	nursery	3-5 yr. olds	1	5.6
2	primary	K-2nd grades	4	22.2
3	intermediate	3rd-5th grades	5	27.8
4	junior high	6th-8th grades	4	22.2
5	senior high	9th-12th grades	4	22.2

TABLE 3: Grade Planned for Compared with Actual Grade Level

A.

code	category	#	%
1	nursery	1	6.3
2	primary	9	56.3
3	intermediate	6	37.5
	no answer	2	

B.

sample no.	actual grade	planned grade
1	4	3
2	2	2
3	1	-
4	4	3
5	4	2

B. (continued)

sample no.	actual grade	planned grade
6	5	3
7	3	2
8	5	-
9	4	3
10	5	3
11	3	2
12	2	2
13	3	2
14	2	2
15	3	2
16	2	2
17	5	3
18	3	1

C.

actual grade level	planned grade level
nursery	1 (no response)
primary	4 (primary)
intermediate	1 (nursery) 4 (primary)
junior high	3 (intermediate) 1 (primary)
senior high	2 (intermediate) 1 (no response)

Table 4 shows the number, percentage, and cumulative frequency of the responses given for class size. It is of interest here to point out that, under cumulative frequency, nearly 95% responded with a class size of eleven or less. Other pertinent statistics to class size are the mean=7.833, the mode=6.000, and the standard deviation=3.899.

TABLE 4: Class Size

size	#	%	cumulative frequency %
3	1	5.6	5.6
4	1	5.6	11.1
5	1	5.6	16.7
6	4	22.2	38.9
7	4	22.2	61.1
8	2	11.1	72.2
9	2	11.1	83.3
11	2	11.1	94.4
21	1	5.6	100.0

Table 5 summarizes responses given to minutes per day spent on science, with the number, percent, and again, cumulative frequency given. Under minutes per day, the mean was 38.176, the mode was 40.000, and the standard deviation was 15.541.

TABLE 5: Minutes Per Day Spent On Science

# minutes	#	%	cumulative frequency %
0	1	5.9	5.9
12	1	5.9	11.8
22	1	5.9	17.6
28	1	5.9	23.5
30	1	5.9	29.4
40	5	29.4	58.8
45	1	5.9	64.7
50	4	23.5	88.2
52	1	5.9	94.1
60	1	5.9	100.0
no answer	1		100.0

The responses given to the question "What science topics have you covered this year?" were categorized into three areas: Biology, Earth Science, and Physics. These responses were entered into the computer such that if a certain category was listed, it was entered as a "yes" response, and if not listed or mentioned, it was entered as a "no" response. This technique was also utilized for responses given in Tables 7, 8, 9, and 11. Table 6 shows the number and percentage responding "yes" to having taught each category, and the number and percentage responding "no" to each category, as well as the number having no response to any category.

TABLE 6: Science Topics Taught

topic	# yes	%	# no	%	no response
Biology	16	100.0	0	0	2
Earth Science	13	81.3	3	18.8	2
Physics	4	25.0	12	75.0	2

Difficult aspects of teaching deaf students are summarized in Table 7. Those aspects mentioned were:

1. no difficult aspects were mentioned
2. the topic of physics is difficult
3. the complex vocabulary of science makes teaching difficult
4. not having enough or finding materials
5. teaching concepts
6. not having enough visuals
7. alot of preparation time is needed
8. teaching abstract ideas is difficult, as opposed to concreteness
9. the scientific method is difficult to teach
10. the topic of the metric system
11. the topic of ecosystems

The number and percentage of those responding "yes" and those responding "no" are summarized in this table.

TABLE 7: Difficult Aspects of Teaching Deaf Students

aspect	# yes	%	# no	%
none	1	5.6	17	94.4
physics	3	16.7	15	83.3
vocabulary	7	38.9	11	61.1
materials	4	22.2	14	77.8
concepts	3	16.7	15	83.3
visuals	7	38.9	11	61.1
preparation time	3	16.7	15	83.3
abstract ideas	7	38.9	11	61.1
scientific method	1	5.6	17	94.4
metric system	1	5.6	17	94.4
ecosystems	1	5.6	17	94.4

Table 8 summarizes the topics the teachers felt students should be exposed to but haven't yet had the opportunity to be. The number and percentage responding "yes" and "no" to these

varying needed topics is given.

TABLE 8: Needed Topics

topic	# yes	%	# no	%
most topics	6	33.3	12	66.7
energy	2	11.1	16	88.9
physical science	2	11.1	16	88.9
man and nature	1	5.6	17	94.4
survival sciences	1	5.6	17	94.4
health sciences	2	11.1	16	88.9
hands-on	1	5.6	17	94.4
seasons	1	5.6	17	94.4
physics	1	5.6	17	94.4
ecology	1	5.6	17	94.4
communities	1	5.6	17	94.4

Table 9 provides a list of resource materials stated as available to the teachers for the deaf, with the most responses for textbooks and microscopes.

TABLE 9: Resource Materials Available

resource	# yes	%	# no	%
textbooks	8	44.4	10	55.6
microscope	6	33.3	12	66.7
audio visuals	3	16.7	15	83.3
posters	2	11.1	16	88.9
models	3	16.7	15	83.3
greenhouse	1	5.6	17	94.4
science lab	1	5.6	17	94.4
planetarium	1	5.6	17	94.4
dittos	3	16.7	15	83.3
plants	3	16.7	15	83.3
animals	2	11.1	16	88.9
games	1	5.6	17	94.4
magnets	2	11.1	16	88.9
hand lenses	2	11.1	16	88.9
collections	2	11.1	16	88.9
science kits	1	5.6	17	94.4
overhead projector	1	5.6	17	94.4
simple machines	1	5.6	17	94.4
test tubes	1	5.6	17	94.4
meter stick	1	5.6	17	94.4
T.V.	1	5.6	17	94.4
woods	1	5.6	17	94.4
hardware	1	5.6	17	94.4

Table 10 shows the responses to the possible offer of activity sheets to use with the deaf students. An overall positive response is exhibited.

TABLE 10: Activity Sheets

response	#	%
yes	13	86.7
no	2	13.3
no answer	3	----

Table 11 summarizes responses given to the open-ended question "Do you have any other suggestions, advice, or comments that might be helpful?" These responses came in the form of the following:

1. Any pertinent books or pamphlets known of would help.
2. Any topics taught should be relevant to the student's life.
3. Science needs to be taught beginning at an earlier age.
4. The metric system would be a useful, relevant topic for the future.
5. Teaching needs to be with more visuals and hands-on experiences.
6. Science needs to be taught in simple topics.
7. It was suggested to gain an understanding of language acquisition in deaf people before trying to plan teaching activities.
8. Science topics need to be sequential.
9. A pre test and post test would be helpful in teaching environmental topics.

TABLE 11: Suggestions

idea	# yes	%	# no	%
books and pamphlet	3	16.7	15	83.3
relevant topics	2	11.1	16	88.9
earlier science needed	1	5.6	17	94.4
metric system	1	5.6	17	94.4
more visuals and hands-on	2	11.1	16	88.9
simple topics	1	5.6	17	94.4
understand language acquisition	1	5.6	17	94.4
sequential	1	5.6	17	94.4
pre and post tests	1	5.6	17	94.4

Pearson Correlation Coefficients were computed for many of the variables on the questionnaire. In determining significant correlations, a P level of .1 was used. This means that nine out of ten times the correlation is not by chance. Any P value of less than .1 is included in the following table of significant relationships.

TABLE 12: Significant Correlations

correlation variables		P
grade	class size	.068
grade	minutes/day on science	.006
grade	earth science taught	.046
grade	grade planned for	.001
grade	difficult aspects - visuals	.079
grade	difficult aspects - scientific method	.086
grade	difficult aspects - metric system	.086
grade	difficult aspects - ecosystems	.086
grade	needed topics - most topics	.019
grade	needed topics - energy	.082
grade	needed topics - man and nature	.086
grade	needed topics - survival sciences	.086
grade	needed topics - ecology	.086
grade	needed topics - communities	.086
grade	resources - greenhouse	.086
grade	resources - science lab	.086
grade	resources - planetarium	.086
grade	resources - plants	.064
grade	resources - animals	.054
grade	resources - magnets	.054
grade	resources - hand lenses	.054
grade	resources - collections	.054
grade	suggestions - earlier science needed	.086
grade	suggestions - metric system	.086
grade	suggestions - more visuals	.082

TABLE 12 (continued)

correlation variables		P
grade	suggestions - sequence needed	.086
grade	suggestions - pre and post test	.086
class size	earth science taught	.095
class size	physics taught	.079
class size	difficult aspects - visuals	.068
class size	difficult aspects - abstract ideas	.087
class size	needed topics - health science	.048
grade planned for	difficult aspects - materials	.047
grade planned for	difficult aspects - visuals	.067
grade planned for	difficult aspects - abstract ideas	.055
grade planned for	needed topics - most topics	.085
grade planned for	needed topics - energy	.042
minutes/day on science	difficult aspects - none	.077
minutes/day on science	difficult aspects - materials	.040
minutes/day on science	difficult aspects - visuals	.042
minutes/day on science	difficult aspects - preparation time	.076
minutes/day on science	resources - audio visuals	.096
minutes/day on science	resources - magnets	.048
minutes/day on science	resources - hand lenses	.048
minutes/day on science	resources - collections	.048
minutes/day on science	resources - simple machines	.041
minutes/day on science	resources - test tubes	.041
minutes/day on science	resources - meter sticks	.041
difficult aspects - none	resources - posters	.001
difficult aspects - none	resources - models	.010
difficult aspects - physics	resources - greenhouse	.010
difficult aspects - physics	resources - science lab	.010
difficult aspects - physics	resources - planetarium	.010
difficult aspects - physics	resources - simple machines	.010
difficult aspects - physics	resources - test tubes	.010
difficult aspects - physics	resources - meter sticks	.010
difficult aspects - vocabulary	resources - textbooks	.036
difficult aspects - vocabulary	resources - dittos	.073
difficult aspects - vocabulary	resources - animals	.033
difficult aspects - abstract ideas	resources - planetarium	.008
difficult aspects - abstract ideas	resources - animals	.033
difficult aspects - scientific method	resources - microscope	.082
difficult aspects - scientific method	resources - greenhouse	0.0

TABLE 12 (continued)

correlation variables		P
difficult aspects - scientific method	resources - science lab	0.0
difficult aspects - scientific method	resources - planetarium	0.0
difficult aspects - metric system	resources - microscope	.082
difficult aspects - metric system	resources - greenhouse	0.0
difficult aspects - metric system	resources - science lab	0.0
difficult aspects - metric system	resources - planetarium	0.0
difficult aspects - ecosystems	resources - microscope	.082
difficult aspects - ecosystems	resources - greenhouse	0.0
difficult aspects - ecosystems	resources - science lab	0.0
difficult aspects - ecosystems	resources - planetarium	0.0

DISCUSSION

It has been stated previously, in the result section, that, though actual grade levels through high school were taught, none of the curricula were planned above the intermediate level. This result might be explained by knowledge gained from previous literature. Most of the deaf person's knowledge is built on concrete ideas with very basic terminology. His understanding does not equip him to deal with abstractions, and his knowledge of terms is such that it is unlikely that he would be able to understand any interpretive signs. (discussing National Parks) This is also backed up by responses to the difficult aspects of teaching deaf students: vocabulary, concepts, and abstract ideas. As one increases into higher level science courses, such as physics, more concepts and abstract ideas are taught. This is perhaps why curricula are not planned above the intermediate level.

The questionnaire, because of its open-endedness, may have allowed some sources of error. For instance, if a teacher made no response to the question on difficult aspects of teaching deaf students, one could not say for sure whether he/she meant there was nothing difficult about teaching the deaf or he/she did not feel like taking the time to think and write out an answer. Again, with resource materials available, one can not be certain that teachers did not have other resources, but simply could not think of them at the time. In general, however, the results appear to show that

conventional types of resources (textbooks) are most used. This apparent lack of hands-on type of resources opposes the need of deaf students to learn through actual experience. As written by Collea,

> If a program is to be used successfully with deaf children, it should provide for repetition of concepts and words describing them. These repetitive activities are essential to the development of a deaf child's comprehension of new language and concepts. For deaf children, language is most easily attained through real and meaningful experiences.[6]

A number of the correlations may be significant in a variety of aspects. A P value of .068 was found for "grade" and "class size." Except for the nursery level, class size, on an average, increased with increased grade level.

Grade category	Class size, average
1=nursery	8
2=primary	6
3=intermediate	6.6
4=junior high	8.75
5=senior high	10.25

This may point out the need for increased amount of attention needed for younger children, yet might also identify the potential, with less students in the younger grades, to increase the hands-on type of experiences especially valuable in science. As again stated by Collea,

> Learning for all young children is largely through the senses, but language has a special role. Concepts have to be talked about; children need to express or interpret the sensory intake. For the deaf and hearing impaired

> child, the language aspect may be difficult unless one remembers that body language and art forms are means of communication. These children can engage in all tasting, smelling, touching, and seeing experiences. If the adult remembers to face the child while speaking, on his eye level, this can aid the child's language development. Attention to hearing aids is important for those children who have such assistance. Speaking slowly and distinctly is also important, as it is for working with all children who are developing their speech patterns and language. Depending on the age of the child and the degree of hearing loss, the teacher may be able to elicit sufficient language to ascertain the child's comprehension of sorting materials attracted and not attracted to magnets, for example. Usually hearing impaired children benefit from extra adult attention initially.[7]

"Grade" and "minutes per day spent on science" show a low P value, .006, with the higher grades spending, on the average, more time on science. This would seem to correspond to the amount of time spent on science in the regular classroom, but this opposes the need to begin developing science vocabulary and concepts at an earlier age for deaf students.

High degrees of correlation were seen between "grade" and difficult aspects of "having enough visuals," "teaching the scientific method," "metric system," and "ecosystems." This might be because each of these items is something that would be noticed by one grade level in particular, such as younger grades might be especially interested in need of visuals and the older grades have gotten into more specific topics, such as the metric system. The other difficult aspects would be more pertinent to all grade levels.

"Grade" and "most topics needing to be taught" correlate

because, at the younger grade levels, most science topics have not yet been introduced. The other needed topics with somewhat less of a correlation, but still significant, are topics more specific to increased understanding of concepts: energy, man and nature, survival sciences, ecology, and communities.

Those "grade" to "suggestions" with a high degree of correlation (see Table 12) were, except for one junior high, all from senior high school teachers. This would appear to show the understanding of senior high teachers as to what is lacking from the backgrounds of deaf students in science. These observations could be very useful for teaching science to younger deaf students.

"Class size" and "earth science and physics already being taught" may have a significant correlation due to the fact that on the average, classes where earth science was taught were smaller (6.6) than classes where physics was taught (8.5). This corresponds to smaller class sizes in younger grades where earth science is more likely to be taught because of its concreteness, and larger class sizes in older grades where physics, with its abstractness, is more likely to be taught.

"Minutes per day spent on science" showed high degrees of correlation with four "difficult aspect" variables: no difficult aspects, materials, visuals, and preparation time. Corresponding average minutes per day were, respectively, 60 minutes, 50 minutes, 47 minutes, and 50 minutes. Each of

these time lengths is in the highest range, which fits well with the responses of needing more materials, more visuals, and taking much preparation time. The correlation between 60 minutes spent on science and no difficult aspects is not understood. It is interesting to note that each of the four teachers that responded having difficulty finding materials also responded with spending 50 minutes per day on science.

Results of correlations dealing with "resources" showed much significance, however this will not be discussed, or deemed as significant because of the source of error due to the open-endedness of the question. So few teachers responded to each variable, except textbooks and microscopes, that this data is better used simply for background information to any activities planned for these specific schools.

CONCLUSION

A number of conclusions can be made from the observations and data obtained. First, from observations made at the field trip program for hearing impaired students at Corkscrew Swamp Sanctuary, Environmental Education can be a very useful and rewarding educational tool with deaf students. As stated in the report for that project, "The deaf student seemed introverted as we began the walk, but opened up to excitement and participation when I asked her questions directly and showed interest in her understanding. As the student's teacher mentioned, the most important thing with this group of children is to get them into social activities, to acquaint and teach them to be a part of society. They do not need to be excluded or separated as many would believe." While observing deaf students as they visited the swamp, it was noted that the use of other sense beside hearing is very important. A program for deaf students might include activities to particularly sharpen visual awareness, as well as smelling, touching, and in some cases, tasting. Another fun part of the walk was naming the plants using hand signs. For example, fireflag is represented by two motions, one for fire and one for flag. A program for the deaf might also incorporate this unique aspect of signing.

Conclusions drawn from observations made at Hilltop School were that words need to be simple, ideas need to be concrete, that inner language comprehension is the key to the

deaf student's capabilities, and that something visible, tangible, perhaps drawn on the board, or having an object there, helps increase understanding.

Data from the questionnaire indicates that, though there is a need of deaf students to learn through actual experience, there is a lack of hands-on type resources. Perhaps more resource materials could be obtained, but another possibility is including more activities outside the classroom, on the school grounds, with the natural environment available. Because there are, on the average, less students in the younger grades, there may be a potential to increase the hands-on type of experiences especially valuable in science. Another need identified is to begin developing science vocabulary and concepts at an earlier age for deaf students. This has come from the suggestions made by the senior high school teachers, as pertaining to what is lacking from the backgrounds of deaf students in science. Developing science vocabulary and concepts at an earlier age could be begun by spending more time on science each day in the earlier grades. This time wouldn't necessarily have to be teaching detailed information, but giving help in increasing awareness of the size, shape, texture, and effects people have on the environment around them. Topics such as the energy shortage and pollution are not only relevant and observable, but vital to helping deaf students become a part of society.

FOOTNOTES

[1]Dr. Robert Roth, "Clearing the air on Environmental Education," Curriculum Report, March (1977), 2.

[2]Helen Keller, London, 1933, Jacque Marlene Beechel, Interpretation for Handicapped Persons, Masters Thesis, University of Washington, (1974),15.

[3]Jacque Marlene Beechel, Interpretation for Handicapped Persons, Masters Thesis, University of Washington, (1974),18.

[4]Ben Thompson, "Myth and science for the handicapped," Science and Children, November/December (1979), 16-17.

[5]Bob Faber, "Adventures in awareness in Mayfield City Schools," Environmental Education Report, September (1978),10.

[6]Francis P. Collea, "Science in sounds," Science and Children, March (1976),34.

[7]Ibid., p. 50.

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APPENDIX A

Special Project Report

Suggested as a part of the internship program at Corkscrew Swamp Sanctuary is a special project. My interests, developed from a proposed Honors Research project on Environmental Interpretation for the Deaf at Ohio State, were working with a group of deaf people here at Corkscrew.

Lee County has established a good Environmental Education center, which caters to exceptional students in the Ft. Myers area. I visited there and talked with three staff members specifically about activities done with the handicapped groups, then I arranged a program with a class in Collier County. I worked for three consecutive weeks with three different middle school students each time. Having children with varying exceptionalities, deafness, mental retardation, or physical impairment, helped me to understand the needs and capabilities of each student, and decide that I would like to continue working with the deaf.

Corkscrew Swamp Sanctuary lends itself to people in wheelchairs, because of the boardwalk and paved trail. I also noticed that the student in the wheelchair was very bright, inquisitive, and grasped concepts about the swamp from objects I talked about. I would like to see more people in wheelchairs visiting Corkscrew, since this opportunity is there.

The mentally retarded children were enthusiastic in looking

for animals and plants, yet didn't seem to understand processes or the swamp as a whole. The deaf student seemed introverted as we began the walk, but opened up to excitement and participation when I asked her questions directly and showed interest in her understanding. As the student's teacher mentioned, the most important thing with this group of children is to get them into social activities, to acquaint and teach them to be a part of society. They do not need to be excluded or separated as many would believe.

I chose to extend my experience by inviting an entire class of deaf students to Corkscrew for a field trip. Four classes, totaling thirty-two students, from Allen Park Elementary School decided to participate. I asked another naturalist, JoAnn, to help me, for this large number would be difficult to guide all at once. Allen Park holds a program called McHip, for hearing impaired students from the surrounding area.

JoAnn and I prepared a slide program to give the children an idea of what they would be seeing and what to look for. We also suggested drawing a picture of what each person hoped to see. The four classes were divided into two groups, those who read lips and are learning to speak, and those who learned only signing as a means of communication. An interpretor was necessary for the total communication group. I did the first slide program, and talked a little about Corkscrew Swamp. The classroom was light enough for the children to see my lips, and the teacher gave me a microphone connected to the student's hearing aids. Some students were deaf to high frequencies,

some to low, and though they could not hear everything I said, all other opposing sounds were blocked out. This group was so enthusiastic about pointing out things on the slides and naming objects. I had no trouble getting them to participate.

I observed the total communication group. Their behavior was completely different. Their inability to speak and read lips inhibited them so obviously. They reacted more to the interpretor than to the naturalist. When the classes arrived for the guided walk, I led the total communication group. They opened up a little more being able to see the swamp close at hand, yet still seemed inhibited. Having four teachers to interpret using signs helped immensely, to give individual attention to each student's understanding.

I stressed the most important aspect of the swamp, the water, and the different plants and animals found according to the amount of water. I also feel the use of other senses beside hearing is very important. A program for deaf students might include activities to particularly sharpen visual awareness, as well as smelling, touching, and in some cases, tasting. An example for smelling I used was having each student smell the object held in my hand, without seeing it, and scouting the area to find it. This was fun and challenging.

Another fun part of the walk was naming the plants using hand signs. For example, fireflag is represented by two motions, one for fire and one for flag. A program for the deaf might also incorporate this unique aspect of signing. I was amazed observing the interpretor and students, a little

baffled, thoughtful in trying to express ideas in a simple manner to understand, and hesitant to use any sarcasm or ideas that might be taken wrong. Water lettuce is edible, but it is not good to eat more than a taste. I decided not to mention it at all, wondering if the children would get the wrong idea.

Passing by the group of students who learned to speak, they seemed very interested, enthused, and anxious to share what they had seen. I would emphasize again the value of learning to speak in communicating.

The project was very successful and enjoyable. Results are that the new intern naturalist will be taking an adult education class on signing, and perhaps taking up a continuing project in this area. Also, the Collier County Schools newsletter will have an article about my project, which will hopefully spur other classes to visit Corkscrew Swamp, especially special education classes.

APPENDIX B

Observations

Hilltop Elementary School in Beechwood, Ohio
Lori Morgan - head of hearing impaired program, three other teachers, speech therapist.

I had a discussion with the class of children in approximately the sixth grade. The teacher interpreted my questions and the children's answers, although I was able to communicate some in sign language, which helped remove a barrier. There was a significant difference in capabilities, especially understanding science. One boy who has very little inner language could not even grasp the idea of being or living in a specific place. He watched a program and studied a unit on the solar system and the planets, which helped him to at least answer that he lived on earth when asked where he lived. When asked "Is that it? Do you live anywhere else?" he would say, "Here. I live here." The teacher said that if you then asked him if he lived in Bedford, he would say yes, but wouldn't come up with that answer himself. In comparison, two other students, a boy and a girl, had a good understanding of science. They had seen a television program about Three-mile Island, and then had a discussion about nuclear energy and nuclear reactors. The kids were even interested in how a nuclear reactor works. Both of these kids had a pretty good understanding of language, could speak pretty well themselves, and were about to be fitted for a hearing aid that would enable them to hear most of what people say. Both were also

getting ready to go into a regular math class and science class.

Other questions I asked were as follows:

Q. Had they ever been to any of the Cleveland Metroparks? ex: the duck pond?

A. Most had, either through school or with family.

Q. What did they see there?

A. Ducks, geese, trees.

Q. Have you ever hiked or walked around in any other wooded areas?

A. Some yes, some no.

Q. What happens to the leaves in the fall?

A. Fall down, rot, go into the earth.

Q. What is the soil used for?

A. Water and food for the trees.

Q. Do you know what animal eats leaves?

A. No - guessed rats, beavers.

Q. Earthworms!

A. They were surprized and interested.

Q. What is pollution?

A. Most kids didn't remember, but the two that seemed to understand language better did remember. They said it was dirty air and dirty water. Litter was also mentioned. It came from smokestacks and chemicals, etc.

Q. Can there be pollution even if it is not seen?

A. Yes (after some thought) - especially in water.

Q. Do you know anything about the energy shortage or gas shortage?

A. Knew a little about gas shortage - especially at the gas pumps.

Q. I asked if they knew where gas came from?

A. No.

Q. It came from trees!

A. Surprized and unbelieving.

Q. There is not a pump put into the tree, but what happens is the tree, and lots of other trees and plants die and fall to the ground. Through many, many, many years, the dead plants and animals are compacted, pressed together more and more. They go deeper and deeper into the ground, and eventually form oil. After this the oil is drawn out of the ground at an oil well. (A picture was drawn on the board to help visualize the oil well)

APPENDIX C

May 29, 1979

Dear Teacher,

My name is Nancy Weiss and I am a student at Ohio State in the School of Natural Resources. My major is Environmental Education, which means that I would like to become a park Naturalist or Ranger. This entails such things as taking elementary and high school students on hikes in natural areas, giving slide presentations, and providing other activities to help people become more aware and appreciative of their environment. Through an honors program, I am involved in doing a research project, which is why I am here.

My interest is in working with deaf students, perhaps providing them with opportunities they might not normally have, to enjoy and become aware of the natural environment that surrounds them. Having the Ohio School for the Deaf so nearby has given me a chance to get to know some of the students and begin to learn to communicate with them. It is my desire to design a group of activity sheets to be used as a part of, or as a supplement to your science curriculum next year. These sheets will describe an activity that will help the students to learn various aspects about the environment that they may not have been exposed to.(ex: perhaps pollution, energy resources, etc.) Many of the activities will utilize the wooded area behind the school, a beautiful little island of nature in the city of Columbus. A short trail now exists through part of this area, and another possibility is to develop a trail guide for the students to use.

The following questionnaire will provide a means for me to know what your thoughts and suggestions, as the students' teachers, are. I feel your understanding of deaf students will be my most valuable source of information, and I would also like to be a help to you in any way I can. Thank you so much for your cooperation.

Sincerely, Nancy Weiss

1. What grade do you teach?_____
   How many students are in your class?_____
   What length of time do you spend each day on science?____

2. What science topics have you covered this year?

3. At what grade level would you estimate that you plan your science curriculum?_____

4. Have you found any aspects of teaching science difficult, or any aspects hard for the students to understand? Please explain._____

5. Are there any topics you feel the students should be exposed to and haven't had opportunity to yet? Are there any in particular that the wooded area behind the school could help with?_____

6. What resources do you have available to you for your science curriculum? (ex: books, microscopes, plants, etc.)

7. Do you feel some activity sheets for various topics that have not been covered would be helpful, and would you be willing to participate in trying them?_____

8. Do you have any other suggestions, advice, or comments that might be helpful? I would appreciate all you have to add._____

Thank you for your help.